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Professional Action Sport Athletes' Experiences with and Attitudes Toward Concussion: A Phenomenological Study

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Abstract

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Keywords

Concussion, Action Sports, Freestyle BMX, Freestyle Motocross, Big Air, Mega Ramp, X Games

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Professional Action Sport Athletes' Experiences with and Attitudes Toward Concussion: A Phenomenological Study

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This study examined the lived experiences and subsequent attitudes of freestyle BMX and motocross athletes relative to suffering concussions. Eleven professional athletes were interviewed using a semi-structured protocol. All cited a significant personal history with concussion and those personal accounts, along with their observations of others who experienced similar head injuries, shaped the athletes' attitudes towards concussion. Both intrinsic and extrinsic factors contributed to each athlete's acceptance of concussion risk inherent in their respective sport. Generally, athletes accepted concussion risk as part of their sport, but were largely unfamiliar with what concussion was and what long-term effects could result from a history of concussion. Additionally, athletes knew of no concussion protocols or guidelines in their sport and cited an overall lack of organized medical care accessible to them on an ongoing basis, as is the case with mainstream sports. Keywords: Concussion, Action Sports, Freestyle BMX, Freestyle Motocross, Big Air, Mega Ramp, X Games

Dave Mirra was a legend. He was one of a handful of freestyle BMX competitors who revolutionized the sport. For years, Mirra was not only the face of BMX, but also of the entire ESPN *X Games* franchise (Higgins, 2016). His strength and determination were renown and Mirra, himself, was beloved by fellow athletes, sponsors, the media, and fans (Higgins, 2016).

Over the course of his 20-plus year career, Mirra won 24 *X Games* medals. Being first in BMX circles was something that came naturally for Mirra. He was the first to beat legend Mat Hoffman in competition; He was the first to land a double back flip; He was first to be featured on the cover of national sports magazines; He was the first to sign a national sponsorship (Reebok); He was the first to have his own video game; He was the first to land a national television sports hosting gig (Higgins, 2016). He was also the first action sports athlete to be positively – and posthumously – diagnosed with CTE (Roeningk, 2016).

In 2016 and at the age of 41, Mirra was planning a comeback to the sport. But one early February day, that all changed. The man who seemingly had everything, a successful sports legacy, a lucrative television career, a loving wife and two young daughters, died from a self-inflicted gunshot wound (Higgins, 2016; Roeningk, 2016). In May of 2016, an autopsy confirmed that Mirra had suffered from chronic traumatic encephalopathy, or CTE. CTE is a progressive, neurodegenerative disease caused by an excessive buildup of tau proteins in the brain (Ma et al., 2013; McKee et al., 2009). Neuropathologists agree CTE to be caused by repetitive head trauma. Victims of CTE are reported to live with significant depression, mood swings, and other personality disorders. Many are drug depending, and all are at increased risk of suicidal ideation or completion (Ma et al., 2013; McKee et al., 2009). Until Mirra's case was confirmed, CTE in athletes was most commonly connected to the sport of football, where blunt force trauma to the head is undeniable (Ma et al., 2013; McKee et al., 2009; Roeningk, 2016).

Action sports, sometimes referred to as extreme sports, experienced a meteoric rise begin

in the summer of 1995, when national sports network ESPN held its first *X Games* event. Five hundred thousand fans, most of them teenagers and twenty-somethings, witnessed athletes deliver breathtaking stunts on skateboards, rollerblades, and mountain bikes (Pickert, 2009). Other activities at the event, including bungee jumping, sky surfing, and street luge, also found their way into the mainstream sports dialect (Pickert, 2009). Today, ESPN (2015) continues to advertise the *X Games* as, "the ultimate action sports event, attracting adrenalin-crazed athletes from across the globe who continuously push the boundaries and keep coming back to defy gravity" (para. 1). Since 1995, the Games have evolved to include more than 55 different events in both summer and winter venues. In action sports, the word *freestyle* appears to explain the athletes' attitudes as much as the unrestricted creativity of the stunts (Branch, 2013). The sports' non-conformist culture – one in which male competitors are often referred to as *dudes* – has successfully penetrated the Olympic sports movement, too (Branch, 2013; Whiteside, 2014). In the 2014 Winter Olympic Games in Sochi, these so-called action sports accounted for 12 of the 28 total medals won by the United States (Whiteside, 2014). *Vert* (vertical) ramps for both BMX bicycles and skateboards are even being considered for the Summer Olympic program for the 2020 Games (McGrath, 2014).

Action sports athletes have "an insatiable appetite for the extreme" (ESPN, 2015, para. 1). Nowhere is that more evident than in freestyle BMX and motocross events where riders perform incredible acrobatic stunts from impressive heights. In *Big Air* events, competitors are judged on height, creativity, and risk. In recent years, ramp sizes have increased and stunts have evolved from "impressive tricks to outright daredevilry" (McGrath, 2014, para. 21).

Perhaps no one knows the history and risks better than Mat Hoffman. A freestyle BMX star in the early days of the sport, Hoffman's daredevil attitude led to the execution of breathtaking stunts off impressively high ramps. His bravery transcended his sport from backyard gatherings to marquee stadium events:

My job is to kind of keep the authenticity—sport as art. . . . The whole rule is to not have any rules, so that it can evolve into whatever it wants. . . . How much you can dream is how big your sport can be. (McGrath, 2014, para. 20)

While Hoffman revolutionized BMX, his success came with its share of failure. His list of injuries is still legendary among fellow riders. Now in his mid-40s and retired, Hoffman claims to have sustained more than one hundred concussions during his career (Knoxville & Tremaine, 2010). His recollection of his own concussion history and the transcendental nature of the sport suggest that these action sport athletes' carefree attitudes may pose significant long-term risks when it comes to recognizing and treating concussion. The realization that many riders may also be living with CTE as a result of cumulative blows to the head, like Dave Mirra did, further highlights a potential problem.

The prevalence of concussions throughout action sports is apparent. A 2015 study by Sharma et al. examined the prevalence of injuries in seven action sports: surfing, mountain biking, motocross, skateboarding, snowboarding, snowmobiling, and snow skiing. In these sports, participants reported more than four million injuries, of which 11.3% involved head and neck injuries (Sharma et al., 2015). 83% of those injuries were reported to be to the head (Sharma et al., 2015). Skull fractures were particularly concerning, with skateboarders having the highest incidence rate among the action sports studied (Sharma et al., 2015). The four sports with the highest incidence of head and neck injuries were skateboarding (129,600), snowboarding

(97,527), skiing (83,313) and motocross (78,236) (Sharma et al., 2015). Freestyle events in BMX and motocross were not separately distinguished. The authors of that study also pointed out that medical accessibility is an issue for many action sports due to their somewhat remote or non-traditional environments. They concluded that more optimal treatment and better concussion prevention programs needed to be implemented in action sports (Sharma et al., 2015).

While that particular study reported on total injuries in action sports and included mention of concussions, no known studies have specifically explored concussions and the attitudes action sport athletes have toward the injury. The absence of organized medical care in action sports, similar to what other high-risk sports like football and soccer have, is noticeable and concerning, especially given recent studies that have examined sports-related concussion. Multiple studies have shown significant and profound long-term effects can occur, including lingering issues with headaches, dizziness, and vision, as well as anxiety, depression, and dementia (Daneshvar, Nowinski, McKee, & Cantu, 2011; King, 2003). As indicated, severe concussion or repeat concussion has also been linked to CTE (Ma et al., 2013; McKee et al., 2009). Numerous studies have shown that traumatic brain injuries (TBI) including concussion have resulted in the perceived quality of life of individuals. Specific studies have found that deteriorated marital and social relationships, decreased earnings capacity/income, and a feeling of loneliness resulting from a lack of social interaction were common among victims of TBI (Jennum, Kjelberg, Ibsen, & Bendix, 2013; Klönnoff, 2010; Wedcliff & Ross, 2001). History of TBI has also been positively linked to substance abuse (Klönoff, 2010).

Thus, given the nature of freestyle BMX and motocross events, the riders' perceived carefree disposition, and the apparent lack of formalized medical care or guidelines, the purpose of this study was to examine the lived experiences and attitudes of these professional action sport athletes related to concussion and concussive risk.

Researcher's Experiences

The lead author of this study has a primary research focus on concussion management in sport programs. As a practicing athletic trainer, she saw first-hand how often concussions occur and how often it is mismanaged. As a professor, she continues to utilize her professional training and research expertise to benefit her university, her community and her profession at the local, state and national levels. In 2009, she started a concussion awareness campaign in her state that targeting sport leaders, coaches, parents, and athletes involved in sport programs. She placed emphasis on providing concussion education resources to rural communities and to medically underserved sports, including motocross, rodeo, and cycling. In 2010 and again in 2012, she spearheaded successful legislative efforts within her state to adopt mandatory concussion education and management protocols for youth and high school-sponsored sports programs. She travels extensively throughout the Northwest delivering concussion advocacy lectures, and she continues to work with sport leaders throughout her own state to formulate concussion management policy in an effort to keep athletes safe in sport.

The second author has a background in sport and exercise psychology with an interest in athlete attitudes toward injury; Additionally, he has extensive experience with athletic trainer preparation in sport psychology. He is active as a sport psychology consultant with collegiate, professional, high school and youth athletes.

Methods

The purpose of this research was to examine and describe the lived experiences and attitudes of professional action sports athletes related to concussions and concussive risk. Our phenomenological approach explored the essence of shared concepts among the riders, which has been shown to help society understand contextual experience (Patton, 2002). Our study was guided by the following questions:

RQ1: What personal experience did the athletes have with concussion? RQ2: How were attitudes shaped relative to concussion?

RQ3: How did those attitudes influence the athletes' acceptance of concussion risk inherent in their sport?

Research Design

We utilized a qualitative descriptive design model. Qualitative description is a naturalistic method by which authors provide a descriptive summary of an event from the participants' perspective with no a-prior assumptions such as theory building (Sandelowski, 2000). Sandelowski (2000) suggested that descriptive techniques are most appropriate for researchers who investigate questions "of special relevance to practitioners and policy makers" and, in most cases, which are related to event specific situations (p. 337). We deemed this particular research design appropriate for the study because our research questions were focused on participants' experiences with and attitudes towards concussion. We used individual interviewing techniques in order to glean a first person understanding of each athlete's experiences with concussion. Through a process of interpretive phenomenological analysis (IPA), we were able to systematically identify analytic patterns in the data related to each participant's personal experiences with concussion (Gibbs, 2007). Themes were derived from key words and phrases that were shared by multiple participants. These themes shaped the direction of our analysis and helped to validate our interpretation of their experiences and attitudes.

Participants and Sampling

Following Institutional Review Board approval, participants were approached onsite during practice for a top-tiered action sports event in the United States. Through published media, we were aware that some participants at the event were minors. We chose not to approach these riders and only solicited subjects who were of legal age (18+). Only males were competing at the action sports event we attended and thus, our participants were comprised solely of that gender. After introducing ourselves, and our study objectives, we provided each participant an information sheet that explained the study more thoroughly and invited his participation. Small convenient samples allowed us, as researchers, to understand the phenomenon in depth (Patton, 2002). Eleven professional action sport athletes who ranged in age from 19 to 40 participated in the study. The participants represented seven different states and three different countries. All participants competed regularly in national and international *Big Air* or *Freestyle* BMX or motocross events. These particular action sports events were selected because of (a) the high-risk, aerial nature of the activity, and (b) the fact that there are presently no known studies that

have investigated concussion incidence within these particular sports. Table 1 provides a general profile of the participants.

Table 1

Participant Profile

<i>Participant</i>	<i>Action Sport</i>
P1	Freestyle BMX
P2	Freestyle BMX
P3	Freestyle BMX
P4	Freestyle BMX
P5	Freestyle BMX
P6	Freestyle BMX
P7	Freestyle Motocross
P8	Freestyle Motocross
P9	Freestyle Motocross
P10	Freestyle BMX
P11	Freestyle Motocross

Data Collection

Consenting riders were interviewed privately onsite at the event venue. We administered face-to-face interviews using a semi-structured interview protocol. Questions allowed each participant to describe himself and his riding style, and also to describe his own personal experiences with concussion. Participants were encouraged to elaborate on the way concussive injuries had affected them, both from a physical and psychological standpoint. We also sought to discover what the athletes knew about concussion and its potential long-term effects, and how that education was acquired. Each interview lasted between 16 and 40 minutes. This method allowed for flexibility and spontaneity in the conversation between each participant and us. Thus, we were able to individualize each interview according to each participant's responses to our questions. We audio recorded and transcribed all of the interviews. To ensure participant responses were captured accurately, the transcripts were sent electronically to each participant for verification. This process of member checking helped us to ensure the accuracy of the interview transcripts and it allowed each participant with a second opportunity to provide feedback, if he so desired (Onwuegbuzie & Leech, 2007). Member checking is commonly used qualitative strategy that can help reduce "...the chances of misrepresent[ation]" by the researcher (Krefting, 1991, p. 218). However, no participants provided us with additional response during the member checking process.

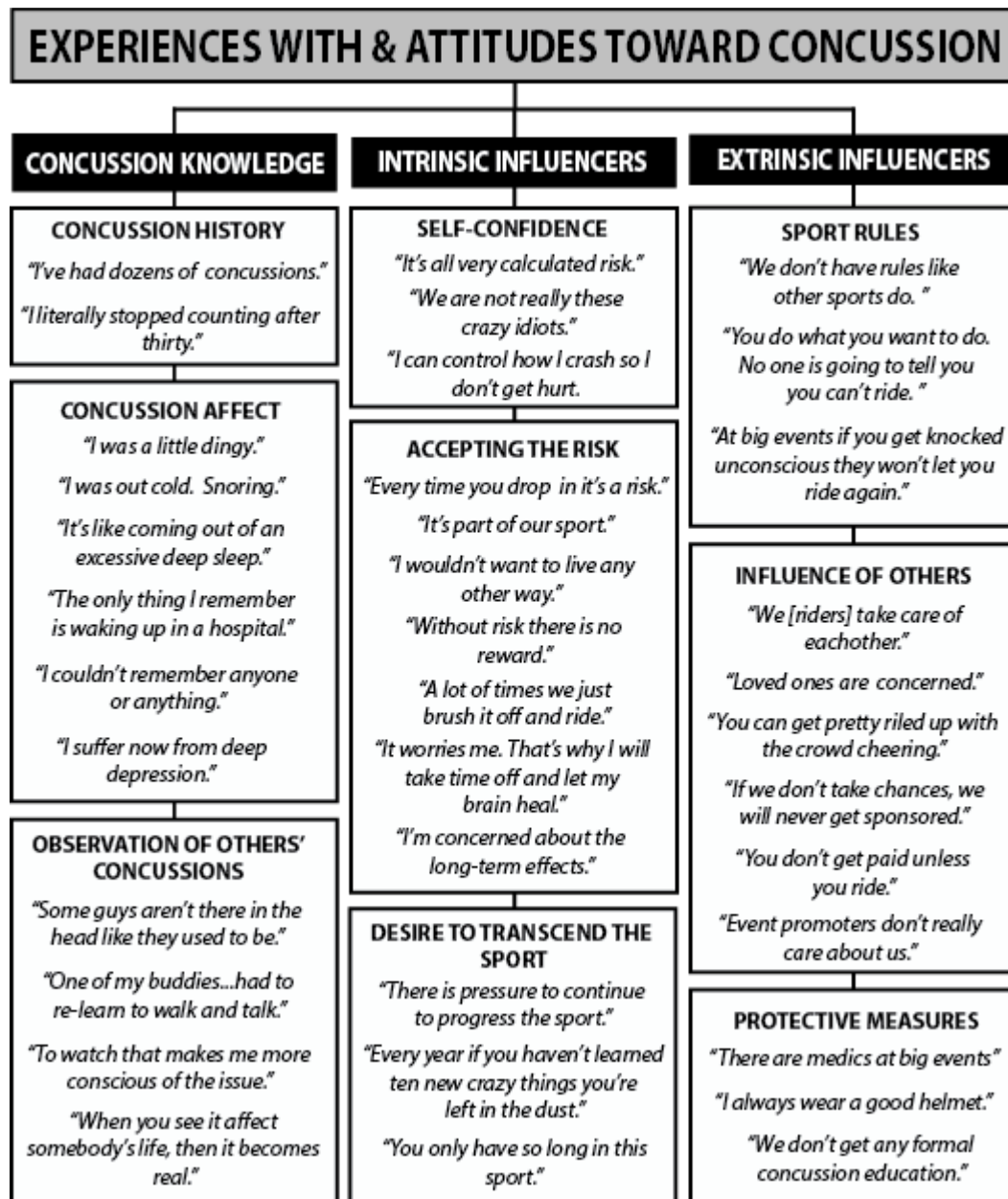
Data Analysis

We triangulated our analysis through member checking, coding, and use of theory. A system of descriptive coding and thematic analysis guided our understanding of the data. A code in qualitative inquiry is “a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data” (Saldaña, 2009, p. 3). Thematic analysis is an interpretive process in which the previously coded data are systematically searched for patterns to provide an illuminating description of the phenomenon (Tesch, 1990). We each independently reviewed the transcripts numerous times for repeated ideas, concepts, and elements. Our IPA was specifically concerned with trying to understand what concussion was like, from the point of viewpoint of the participants. IPA also allowed us the opportunity to examine the personal experiences the participants had with concussion based on their statements (Smith & Osborn, 2003). At each progressive stage of the content analysis, we came to a consensus about our codes, our categories, and finally our themes. A fourth author who was not directly involved with the interview process was asked to review the transcripts and confirm our categories. We reported consensual findings using a combination of hierarchical content trees and direct quotes from the interview transcripts in an effort to enable our readers to better understand the participants’ perceptions and experiences. No inter-coder reliability statistics were computed, as the goal of this analysis was not to test our research team’s ability to identify common themes, but rather to establish a common understanding of the meaning of the various themes through extensive exploration and discussion of the athletes’ perspectives. Biddle, Markland, Gilbourne, Chatzisarantis, and Sparks (2001) suggested that readers should be provided with an opportunity to evaluate and interpret interview data in a way that is most meaningful to them. Therefore, we are presenting the findings of our study using both hierarchical content trees and direct quotations.

Results

A coding process helped us to identify and organize our data’s primary content and essence (Saldaña, 2009). From the codes emerged patterns (or categories), and from these we were able to identify three key concepts, or themes (*Figure 1*) that helped us interpret the participants’ experiences. Our process of thematic analysis attempted to explore and group the participant’s personal views of concussion injury based upon each participant’s own subjective experiences and interpretations (Smith & Osborn, 2003). Each theme helped to guide our understanding of the experiences action sports athletes relative to concussion, and their attitudes towards continuing to compete in a sport swarmed by concussive risk. Themes were identified as (a) knowledge of concussion, (b) intrinsic influencers, and (c) extrinsic influencers.

Figure 1. Thematic Constructs



Concussion Knowledge

Knowledge about concussion was obtained through three primary sources: (a) personal concussion history, (b) concussion affect, and (c) personal observation of others who had experienced concussion. Every participant discussed having sustained numerous previous concussions, and several provided elaborate descriptions of the concussion experience. An array of symptoms was reported, and these symptoms consisted of cognitive, emotional, and physical effects.

Concussion history. The number of sport-related concussions reported was profound.

Participants self-reported anywhere from four to “dozens...maybe even more than a hundred” (P10) concussions sustained during their riding careers. P2, a 31-year old BMX rider who started racing when he was 12, reported being “knocked out cold at least five times” in his career. P3, a 21-year old who had been riding professionally for four years, said he had experienced “at least ten-plus...easily” concussions. P7, a freestyle motocross rider, noted, “I literally stopped counting at thirty concussions. I have had upwards of forty now, and it is getting harder to recover.”

There was some confusion, however, about what constituted a concussion. It became clear to us during the interviews that several participants were only counting the number of times they had been “knocked out cold” as a concussion. P5 stated that he had experienced four concussions where he was “out cold” but added that he had “too many [other times] where I was really dazed and saw stars and stuff. But I don’t consider that a concussion, you know?” P6 claimed he had “at least a dozen or more solid [times] where you see stars. They just twinkle for a bit but you don’t lose memory.”

Concussion affect. Several participants gave very vivid accounts of their previous concussions. P1 and P6 described the resulting effects of being concussed as being “dingy” or “stupid:”

There were a few where I was still conscious to the world, but I did not really come to and understand what was going on for about an hour or so. And then [when I did] I was still a little dingy. I’d say four out of the seven were out cold snoring.

[After one concussion] I was stupid for eight hours – where you don’t know what is going on. You ask the same questions over and over. You don’t know where you are.... [Another time] I knocked myself out, and I was probably stupid for four hours where I couldn’t remember things. My brain just wasn’t processing right. The brain wasn’t remembering things. I forgot that I even rode bikes. (P6)

The concussion experience was hypnagogic for others:

It’s like coming out of an excessive deep sleep - one where you are in a dream and you can’t escape it and you’re trying to wake up so hard. It’s similar to that – [but] everything is black you can’t see anything. You first start hearing sounds when you start coming to. You start hearing sounds and then you start to be able to make out those sounds that are voices.

And then those voices turn into words. And then eventually you start to see light - like you know when your eyes are closed and the sun is shining and you start to see variables of light. And eventually you can start to open your eyes and you start seeing. It is a very slow process - like you have been drugged and you’re coming out of amnesia from surgery. That’s another good way to explain it. (P1)

When people would ask me questions, I felt like my speech... when you say, like, a word over and over let’s say a hundred times... it doesn’t seem right. It doesn’t

sound like a real word. It sounded like every word coming out of my mouth was that kind of word. And I'm, like, ... 'They don't understand what I'm saying!' I would get halfway through a sentence and stop and they were, like, 'What's wrong?' I'm, like, 'You can't understand me?' 'Yeah. Yeah, we understand you.' 'What's going on?' I got so frustrated. I ended up in tears, and I'm, like, 'I don't know. It doesn't make sense. Nothing makes sense!' And then they would ask me questions like, 'What's your brother's name?' And I would have to sit there and struggle and struggle and I would be, like, 'Linda?' And they would say, 'No. That is your sister's name! What's your brother's name?' And I would struggle and think and think and then I'd be, like, 'Angie?' 'No. That's your other sister's name!' I'm like, 'I don't know. I can't figure it out!' It was frustrating! (P6)

My brain just wasn't processing right. The brain wasn't remembering things. I forgot that I even road bikes. I was sitting there watching these guys ride and I was like a kid: 'Oh, my gosh! This looks like so much fun! I wish I could do that!' ...I went up to one of my friends and I was like, '[name of person] Come here!' He comes over and I'm like, 'I can do this stuff, right?' 'Yeah! Yeah, you ride!' So, I go, 'Okay.' And, I was sitting there a while longer and I had to call him back over. 'Come here. Come here!' 'What?' And, I'm like, 'I'm pretty good, aren't I?' 'Yes. You're good!' And I'm like 'Okay. Alright. Alright...' and he went back riding. And a few minutes later I was like, 'I totally remember now' but it's still in my head, 'I got to know. Can I do back flips?' And he was like, 'Yes. You can do back flips!' 'Okay. It's not a dream. It's a reality. I can actually do those things. Like... Alright. Cool!' It's like a dream state. You don't remember. (P8)

Memory loss was cited repeatedly. P7, the 31-year old freestyle motocross rider who acknowledged more than forty concussions ('at least twenty of them were lights out'), said he wasn't aware of the long-term effects of concussion, but acknowledged, 'It's weird 'cause some things I can remember vividly from a conversation six months ago word-for-word, but I will forget a conversation we had ten minutes ago.'

A lack of concussion education, and subsequent ignorance toward the injury's potential for long-term effects, was consistent. Several participants understood the risk of long-term memory loss, dementia, and depression (P1, P2, P4, P5, P6, P9, P10). P5 explained, 'You're going to face depression. You're going to find it hard to focus at different parts in your life. You're going to find memory loss at some point.' P6 cited awareness of national media reports detailing long-term cognitive and behavioral issues with former professional football players and cited those accounts as 'probably something I should be worried about,' and P1 called them 'scary.'

P9, though, revealed a cavalier attitude toward the seriousness of concussion. Despite acknowledging having sustained 'at least dozens, but more than a hundred, probably' concussions during his career, he downplayed their significance:

Personally I have never broken a bone in my life. I have only gotten concussions. It's kind of part of it. It's like, 'Hey. Cool! I didn't break an arm. I'm good to

keep riding.”

P5 admitted that he experiences depression currently in his life, but chalked it up to being normal. This was despite his reported concussion history (three or four where he was “out cold,” “too many” others to count where he just hit his head and was “dazed”). P6, who had sustained “dozens” of “solid” concussions, also said he experienced depression, but also contended that he felt was just part of “the human experience.” P9 questioned whether or not the recent onset of depression could be associated with his significant history of concussion:

One of the [symptoms] I have noticed the most actually is depression. It’s just from hitting my head so much.... For a while I was in a dark depression ‘cause I got knocked out, like, really hard. And then, like a month later, I got another severe concussion.... Actually it was a bunch of, like, bad concussions - all within a couple months of each other. That’s when I noticed that I got all depressed and stuff...I get depressed quite easily now, and I never use to be a depressed person. That’s just not me. So I try, but you know as long as I stay busy...and now it’s kind of like I can’t concentrate because if I do concentrate and get bored or something then I get depressed.

Still, P9 echoed the sentiments of several other riders that the concussive risk was worth the reward of being able to ride: He said, “There are some side effects from all the head slams. I mean, they don’t really make you happy. But...I wouldn’t want to live any other way.”

Observation of others’ concussions. Several participants fearfully recalled how concussion had affected friends or competitors. Playing witness to concussion had a profound effect. P5 recalled a story of fellow competitors who “aren’t there in the head like they used to be.” Several riders, including P6, acknowledged having a casual attitude toward the injury – until its effects affected others’ quality of life:

As a younger rider you don’t think too much of it. It’s just like, “Well, it comes with the territory. Whatever!” You know? You get one, you move on. No big deal. But when you see it affect somebody’s life, then it becomes real. (P6)

Watching friends suffer from concussion’s career-ending effects shaped attitudes but also served an educational purpose:

One of my buddies [Name of BMX rider], he was kind of like a phenom coming up. He was seventeen and winning *Dew Tour*, which is so impossibly hard to win, and so it was pretty crazy. He was kind of like Michael Jordan. And then the weekend after that, he hit his head.... He had to re-learn to walk and talk, and his career was over.... To watch that kind-of-thing happen and to see what level he was on and where he is now makes me and everyone else more conscious of the issue. (P4)

Even with the experience, riders were quick to characterize some concussions as the results of others’ reckless behavior. P4 recounted a fellow competitor “get knock-out-after-knock-out-after-knock-out, just because he is so crazy and so risky.” (P4)

Intrinsic Influencers

Unanimously, riders were aware of the concussive risks in their sport and accepted these risks. Intrinsically, several factors influenced their attitudes towards concussion. These were (a) the athlete's own self-confidence, (b) their acceptance of the concussive risks inherent in their sport, and (c) their own internal desire to transcend their sport.

Self-confidence. Without question, all the competitors were confident in their abilities, and none conceded that the risk they took was outside their comfort zone. Repeatedly, the phrase "calculated risk" was used to describe the riders' thoughtful planning process. Preparation was essential. Each participant was experienced and each had risen to an elite level in his sport. While they acknowledged that the general public may see their acts as perilous, P4 clarified that, "we are not really just these crazy idiots that will go and just destroy their bodies. It is all very calculated risk - very strongly calculated." As P5 reiterated, self-confidence was essential before progression in the sport could occur. P6 even said, "I don't know if it is true to say I'm a risk taker, at all. It's like, if anything, I am very conservative in what I do." (P6) Some linked a history of concussion with diminished confidence. Recalling the story of several other professional riders, P4 recounted, "[Those that have been concussed multiple times] basically just do less and less as far as the skill level that they use to be at. And they just don't have the confidence they used to have on their bike. You can just see it. It's just fading away. (P4)

Competitors also claimed they were confident in avoiding concussion blows because they could "control" the way they crashed. P2, P4 and P5 all contended that it was "normal" for riders to crash. P5 stated that he had "learned how to crash" through gymnastics training. He added that he was "fairly good at keeping away from landing on my head." P4 agreed that "crashes are inevitable" but that he, too, could also control the way he crashed to avoid hitting his head. He explained a run earlier in the day:

I wrecked today just on a simple trick. I went too far and had too much speed, but I knew on that trick that even though I'm going upside down twice and spinning crazy, I knew on that trick that the worst case scenario is that I would slip out and land on my butt, which is what happened. I got a little bruise on my butt, so no big deal. It is a calculated risk. It's okay. Everything just went wrong, but you're going to slip out and land on your butt.

Acceptance of risk. Self-confidence guided the acceptance of risk. Participants clearly understood the aerial risks they took had the potential for big air, hard landings, and spectacular crashes, especially when careening down a *Mega Ramp* that can range from 60 to 200 feet tall. Risk, itself, was obvious and inevitable. P1 clarified, "Every time you drop in, it is a risk." But BMX and motocross riders said that even though they had grown comfortable with the progressively increasing speed and heights in their respective sports, there were times they had to "push themselves" (P5) or "psych [themselves] up" (P1) before an attempt. This included a willingness to risk concussion and other substantial injury. Several credited his own personal acceptance of such significant risk as a reason why he had progressed to an elite level within his sport:

That's what keeps people away, and it keeps people elite, you know, because we are willing to take those risks. . . . I can honestly say that every chance I have ever

taken has been one hundred percent because I wanted to. . . . I have been able to travel the world with riding my bike and I get to do a lot of cool stuff. So it's just one of those things that you take the good with the bad. (P2)

Ensuring their own personal livelihood in a sport with few monetary guarantees or sponsorships was also cited as a motivator:

We're not getting paid to sit on the couch. So, it's like, you hit your head or you crash or anything and you have a show the next week... and you're doing everything you can to get better to get back to the show so we can make money. We only have so long in this sport. It's not something you do when your fifty, you know? (P8)

Once injured, athletes willingly accepted the additional risk of continuing to compete. P4 explained that often he would hit his head, but that if he did not get "knocked out," he was willing to "brush it off" and continue riding. He agreed that his decision was "probably not the best," but that his "personal goals" were more of an immediate concern.

Desire to transcend their sport. Both BMX and motocross riders felt an additional burden to keep their sport relevant in the eyes of the public. All were cognizant of the meteoric rise of their sport since the debut of the *X Games*. While they were thankful for the international mass media attention garnered by their sport, they scoffed at the representation of their sport as *death defying*. As stated, they believed the risks they took were calculated and that crashes were inevitable, but also controllable. They clearly understood the public's perception of their sport as one that features daredevils on bikes. Several riders pointed out that they first became interested in the sport as a result of a professional rider reaching out to them at a local skate park and inspiring them to pursue the sport. Many riders considered mentorship to a grassroots audience an essential part of being a pro. But they also clearly understood that in order for their sport to continue getting national and international media attention, the tricks they performed and the heights they attained needed to evolve. If they failed to keep up with the need for new eye candy, the general public would lose interest and their sport could die. This assumption, along with a willingness to stay relevant as a professional rider, prompted the riders to take additional risk as they attempted to perfect skills otherwise deemed unattainable. As P4 stated, "Every single year if you haven't learned ten new crazy things, you're left in the dust. P5 added,

It's a consistency thing. If you can't stay consistent and stay healthy, it's not going to get you anywhere. Just doing a crazy thing at one event or a crazy thing at two different events over a couple years, or only showing up once in a while is not going to get you there. It's being able to do a consistent thing every time. So, if you're not able to perform something crazy every time, you're not going to catch the eye. You're not going to move up to the next level. That one time of being crazy doesn't do anything. It's a consistent crazy, and you are investing your whole life to make that happen.

Extrinsic Influencers

Extrinsic influences regarding acknowledgement of concussion risk were obtained from

four primary sources: (a) sport rules and regulations, (b) influence of others, and (c) protective measures.

Sport rules and regulations. There was an obvious lack of formalized concussion guidelines within the sports of freestyle BMX and motocross. Competitors attributed this to the fact that their respective sports lacked a governing body or any type of athlete union. The lack of formal organization was a sensitive subject for many. Several felt the riders lacked the collective protection athletes receive in other sports. They were aware that other sports, like football, hockey, and basketball, have mandatory concussion guidelines that provide top level medical consultation following concussion and restrict an athlete's own ability to decide for himself whether or not he can continue. In these action sports, "it's just up to the athletes to monitor [their own] injuries." (P7)

Onsite medical care of concussion was limited to their sports' marquee events like *X Games* and *The Dew Tour*. At these types of large-scale events, "they'll take you off and they do some tests and everything like that and they won't let you ride." (P4) They won't let you ride again. At regional events, which riders say comprise the majority of the freestyle BMX and motocross competitions, they "normally have at least EMTs on site," but rarely physicians, athletic trainers, or other concussion specialists. According to the riders, the overwhelming majority of concussions experienced result during *backyard* practices. Only one athlete interviewed said his sponsor provided ample access to medical care and medical insurance. The rest of the participants had little to no regular medical care coverage, and most were unable to afford seeking concussion care. P4 stated that any medical care he solicited was "out of my own pocket." And as P6 pointed out, it is exceptionally rare for any professional BMX or motocross athlete to earn more than \$50,000 per year.

Influence of others. Fellow competitors, family, sponsors, fans, and event promoters were all cited as people who had influence over the riders when it came to riding while concussed. "If somebody has a concussion," P4 stated, "we generally are like, 'Dude, that was a bad one. You are done for the day!' and we will make them go get checked out." As expected, the riders' loved ones and family members were also cited as quick to intervene. Contrary to our research assumptions, sponsors were also not mentioned as a significant source of pressure. In fact, most riders felt their sponsors encouraged them not to ride when injured.

Pressure to ride while concussed came from two sources: fans and event promoters. P1 remarked that "you can get pretty riled up with the whole crowd cheering you on and everything." P8 also acknowledged "dropping in" at X Games when he was "not all together there in the head" simply because the crowd was "huge [and] amazing." Several riders also suggested event promoters were only interested in the financial aspects of the sport, not about athlete safety.

Protective measures. Use of helmets was universally cited as a method by which riders aimed to prevent concussion. P3, P8, and P9 all cited recent advancements in helmet technology, and P4 pointed to the use of full-face helmets on *Big Air and Mega Ramps*. Riders were also aware that in many mainstream sports, athletes receive formalized concussion education to help them self-identify the signs, symptoms, and behaviors consistent with concussion, and that athletes in those sports are made more aware of the potential for long-term, catastrophic outcome. No participant had ever been subjected to or offered formalized concussion education and none had received warnings about the potential long-term outcomes associated with concussion or the risks involved with continuing to compete while concussed.

Conclusions

Dave Mirra's death has cast a grim cloud over BMX and other action sports where daredevilry – and subsequent risk of head trauma - is inherent. Our study highlights information related to action sports athletes' own experiences with concussion, their attitudes towards the injury, and their own competitive desire to compete in a sport that poses such significant concussive risk. Concussion knowledge and both intrinsic and extrinsic influencers shaped the following attitudes toward concussion:

1. Athletes accepted concussive risk as part of their sport. However, the riders were unfamiliar with the true definition of concussion and only considered their more serious events (where they were knocked “stupid” or “out cold” to be reasons for concern.
2. There were no clearly defined protocols that guided riders' decisions on the appropriate timeline to return to sport following concussion. Rather, the informally educated athletes made their own sport decisions.
3. There was a casualness about the potential long-term ramifications of concussion history. Athletes lived for the moment. Through observation of others' experiences, they saw concussion to be a catalyst that could end their sport career, yet they were willing to take that chance in order to continue to pursue their sport. At the same time, they understood, fully, that escalating the risks they took was imperative if they were going to transcend their own individual skillsets and, thus, their sport.

There is little question that the riders we interviewed had significant personal experience with concussion. Every rider spoke of previous concussions, and many of them recounted the stories of friends or fellow competitors who had suffered life-altering concussive blows. Phenomenology focuses on individuals' interpretations of their own lived experiences (Nicholls, 2009). These experiences undoubtedly helped shape an attitude we, the researchers, would describe as *naively concerned*. Simply put, the riders knew about concussion, but were unprepared to accept the potential long-term consequences. And even if they had *heard* stories about or *saw* others suffer from such prognoses, their own passion for their sport took priority.

Doob (1947) suggested that learning accounts for most of the attitudes we hold. Participants relayed a significant description of their past experiences with concussion. Concussion, riders understood, was a part of their sport and an inevitable outcome. The number of concussions sustained by some of the competitors during the short course of their careers was staggering. Although each account varied, it was clear that each participant had sustained multiple concussions and each was wary of how such an injury – or series of injuries - could affect their future quality of life. There seemed to be a naiveté concerning possible long-term outcomes. Definitive links have been discovered between concussion and long-term mental and cognitive deficits (Daneshvar et al., 2011; McKee et al., 2009; King, 2003). A concussion history has also been linked ongoing brain degeneration, depression, dementia, and suicidal ideation (Didehbani et al., 2013; McCrory et al., 2013; Brenner, Ignacio, & Blow, 2011; Guskiewicz et al., 2007). While cognizant of the risk of getting concussed, competitors were relatively unfamiliar with this potential, and some even questioned whether or not the depression they are experiencing now could be related to their concussive history.

Professional sport organizations are not immune to legal responsibility when it comes to teaching athletes to understand and appreciate injury risks. Sport leaders, especially those who oversee high-risk sports, also have a recognized duty to provide for the immediate medical needs of their athletes. The lack of consistent and appropriate concussion management protocols and a disregard for formalized concussion education of athletes has plagued numerous sport organizations and prompted thousands of successful lawsuits nationally (Keilman, 2015; National Collegiate Athletic Association, 2013; Robeson & King, 2014). The most notable cases have involved the NFL and the NCAA. To combat negligence risk, most professional sports leagues have policies related to concussion management. Many include baseline and post-concussion neurological assessment. Formalized education programs to teach the action sport athletes about such risks were non-existent within these action sports. Concussion education is common in sport at every level. In fact, all 50 states have mandated it in youth and/or high school sport programs. This study reaffirmed earlier claims by Sharma et al. (2015) that medical accessibility is scarce in action sports and that more optimal treatment and better concussion prevention programs are needed (Sharma et al., 2015).

The riders in this study learned what they know about concussion by watching friends experience the injury, through the media, or through their own personal and often life-altering experience. While such sources can be effective, the information obtained is often filtered and sometimes altered, thereby affecting one's perception of the actual risk. Thus, face-to-face education should be stressed (Provvidenza et al., 2013). Other educational strategies that have been proven to be effective include enhancing peer support groups, workshops, and distribution of printed materials. Most importantly, advocates should stress the process of heightening concussion knowledge, the creation of optimal educational strategies, and the use of evidence-based knowledge to implement rules and policies within sport organizations (Provvidenza et al., 2013).

Hogg and Vaughan (2005) defined attitude as a "relatively enduring organization of beliefs, feelings, and behavioral tendencies toward socially significant objects, groups, events or symbols (p. 150). The attitudes of the riders in this study toward concussion were formed primarily through their own personal experience with concussion, or by their naïve belief that they could somehow *control* concussion occurrence. LaPiere (1934) first mentioned that attitudes based on direct experience are more strongly held and influence behavior more than attitudes formed indirectly. Clearly, the riders were very self-confident in their claims that the risks they took were not only calculated but also controlled. And while many admitted being emotionally affected by witnessing friends or fellow competitors deal with significant concussive events. These attitudes were dismissed when it came time to compete. Just as LaPiere (1934) claimed, attitudes do not always predict behavior. None of the riders expressed a willingness to walk away from the sport, regardless of concussion history or threat. While they were fearful of concussion, the riders seemed quite confident that such significant, life-altering incidents would not happen to *them*.

Attitudes can be difficult to measure because they are based on a hypothetical construct. They can be explicit (i.e., deliberately formed) or implicit (i.e., subconsciously formed). Explicit attitudes develop in response to recent information. Once formed, they are robust and resistant to change. Implicit attitudes are more difficult to ascertain because often a person is unaware these attitudes exist (Whitley, 2010). While all the action sport athletes interviewed expressed concern about concussion, they were unwilling to allow the concern to interrupt their quests. Riders clearly understood the risks required to reach the pinnacle of their sport, and they were

more than willing to take those risks. Despite the visually overwhelming acrobatic stunts they perform, it was particularly clear that these athletes did not consider themselves daredevils, as has been suggested by some media accounts. Rather, they repeatedly stated that the risks they took were “calculated,” or well planned and previously executed (usually in a practice setting) numerous times. They estimated, fully, the risks involved with each stunt and the probable (and even potential) outcomes. While fans and event promoters encouraged the riders to escalate risk, the competitors, for the most part, were hesitant to engage unless it was a marquee event. Jung (1971) contended that one’s attitude predicts the readiness of his psyche to act or react in a certain way. Athletes noted a willingness to injure themselves for the betterment of their sport, but they were unwilling to engage in stunts that were outside their levels of comfort. They could sense a takeoff-gone-wrong, and were willing to *pull out* of a stunt mid-air, landing on their backsides instead of their heads.

Recommendations

While the casual knowledge of concussion displayed by the action sport riders is applauded, it falls short of being considered encouraging. As Murray, Murray, and Robson (2015) pointed out, “concussion has long been viewed a benign occurrence” (p. 76). A cultural change in athletes’ attitudes toward the injury and its management is desperately needed, especially in sports like this where the risk is most evident. Additionally, there is need for action sport leaders to recognize both the risks inherent in their sport and the medical needs of their athletes. While other professional sports have met the challenges faced by concussion, little is being done on an administrative level in action sports. This effort should start with the provision of on-site medical care at all professional events, and with mandatory education of all athletes. Baseline and post-injury screening has become the norm in mainstream sport, and should be implemented in action sports, as well.

Limitations of the Study

There are limitations to this study that will restrict the application of the findings to larger setting. First, qualitative research is not generalizable (Lincoln, & Guba, 1985). It should be noted, however, that generalization was not a goal of our research. Instead, we simply aimed to explore the lived experiences of freestyle BMX and motocross athletes and determine how those experiences affected their attitudes towards concussion and concussive risk. Second, there were only 11 participants in this study, and the participants were recruited at a single professional action sports event. This event featured only freestyle BMX and motocross. Action sports are comprised of a myriad of summer and winter activities. Not all action sports events lack injury education programs and onsite medical care. Therefore, it is possible that these athletes’ views are not representative of action sports, as a whole.

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